If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A

C-A OPERATIONS PROCEDURES MANUAL

15.3.2.9 Test Procedure for BNL Booster Corrector

(Booster/AGS Ring Power Supply Systems Group Procedure EPS-B-009)

Note: This document was formerly a C-A Group Procedure. The content of the group procedure was reviewed by the Technical Supervisor. All approvals and/or issue dates of the original group procedure are maintained for present use.

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

M. Bannon

Booster/AGS Ring Power Supply Systems
Group Procedure EPS-B-009
Revision 00

TEST PROCEDURE FOR BNL BOOSTER CORRECTOR POWER SUPPLIES

1) Calibrate Power Supply's locally.

2) Check remote ------ reference
------ readbacks

3) Check "Iout" ------ magnet current
------ external shunt

remote reference-	+10 v Vref	+Iout (max)
	0 v Vref	Iout=0amps
	-10 v Vref	-Iout (max)

BOOSTER CORRECTOR POWER SUPPLY CALIBRATION PROCEDURE

Note:
Use test rack to perform power supply testing and troubleshooting.

Note:
Use proper safety procedures while performing tests

1) Disconnect the magnet from power supply output and install shunt (ex.=75amps/100millivolt) in series with load.
2) Connect the 9 pin "D" connector into the back of power supply (BNC's on the front of the test rack are ref input and analog out from 9 pin connector.
3) Plug in all connectors in the back of power supply to test rack.
4) Install water hose connections to the power supply and cool transistor banks inside power supply with external water.

DCCT zero adjustment

5) Hook DVM (+) to TP 5 (refer to TP location sheet) and DVM (-) to capacitor C20 (- side). Set DVM to DC millivolt range.
6) Set the Local/Remote Switch on the front of the power supply to **local**. Using the controls on the front of the test rack bring the power supply to **standby**. Allow the power supply to warm up for approx. 2 minutes before zeroing the **DCCT**.
7) Adjust **R29** pot so that the DVM indicates 0 millivolts.

IDLE current adjustment (You will need 2 DVM's to do this test.)

Note:
This is a critical adjustment to avoid thermal runaway on transistors.

8) Set-up DVM #1 to read DC current (10amps max.) Then remove fuse #1 (fuse to + cap bank) and install DVM #1 meter leads in place of fuse.
9) Hook DVM#2 to front power supply BNC (Iout) set DVM to DC millivolt range.

Note:
If PCB has never been set-up before turn pots R68 & R84 CCW all the way, then turn each pot CW 12 turns. This will put you in the ball park adjustment before the actual Idle current adjustment is made.

10) Bring power supply to **Standby**, then **On**
11) Adjust R68 (positive transistor bank) and R84 (negative transistor bank) to obtain .50 amps on DVM#1 and 1-2millivolts on DVM#2.

Note:
Adjust each pot a ¼ turn at a time watching DVM#2 stays within +/- 1.2 millivolts. If reading become to negative adjust pot R68 for more positive current. If readings become more positive adjust pot R84 for more negative current. Increment between the two pots until DVM#1 is .50amps and DVM#2 is 1.2 millivolts.

12) After Idle adjustment is made turn power supply Off and reinstall fuse #1.

Caution:
Be careful cap bank buss is not charged.

DCCT calibration (You will need 4 DVM's to do this test.)

13) Hook DVM#1 to the shunt output BNC. Set DVM to DC millivolt range.

14) Hook DVM#2 to TP 5 and com(C20 [-]). Set DVM to DC volts range.

15) Hook DVM#3 with a BNC Tee to Analog Input BNC on front of test rack. Set to dc volt range.

16) Hook DVM#4 to Analog output BNC on front of test rack. Set to dc volt range.

17) Hook a datel precision voltage source to the Analog input BNC Tee (from step15) (ref needs to swing +/- 10 volts Dc) and set it to zero volts.

18) Turn power supply to "Stand-by", then to "On".

19) Adjust the +/- 10 volt analog ref so that DCCT reads 5.000v @ TP5. (DVM #2) note: this should be max current output of power supply ex. 5.000vdc on DCCT = _____ millivolt on shunt(.75amps / 1 millivolt)

20) Adjust R22 to calibrate Shunt current (DVM#1) to the DCCT current (DVM #2). Check linearity of DCCT to current at 5 steps 0.0v, 1.0 v, 2.0v, 3.0v, 4.0v, 5.0v record current at each DCCT setting.

Calibrate Analog Output to Computer

21) DVM # 4 is looking at the analog output BNC. It should read 2x that of DVM # 2. (TP5) if not adjust R11pot until it reads a 2x DVM # 2.

Calibrate Computer Reference (Analog Input)

22) Adjust R40 pot so that the voltage read at the junction of R38 and R41 is exactly ½ of what the analog reference is which is presently being sent from the datel. (Step #17)

23) Run analog reference as follow:
+ 10v = max (+) output current
Zero = zero output current
-10v = max (-) output current

24) Adjust R44 so that the shunt current reads the maximum power supply output current at the +10v ref. If you run out of adjustment on R44 refer to the following note.

Note:
R44 has a 10 millivolt range. If the desired output current could not be reached with the +10 v analog ref, input then set R44 to its mid point and adjust R40 so the desired output current is achieved with +10vdc analog ref input.

25) Run the analog ref to zero and the shunt should read zero millivolt.

26) Run the analog ref to -10vdc and the shunt should read max negative current

27) Run the analog ref back to + 10vdc and recheck the max positive current.

28) Now run power supply from + 10vdc to zero then to -10 vdc in 9 steps and record the linearity of the ref. vs current output. (ref @ +10.0v ,+7.50v, +5.0v, +2.50v, 0.0v, -2.50v, -5.0v, -7.50v, -10.0v)

29) Hook scope up to Analog output BNC and Analog input BNC.

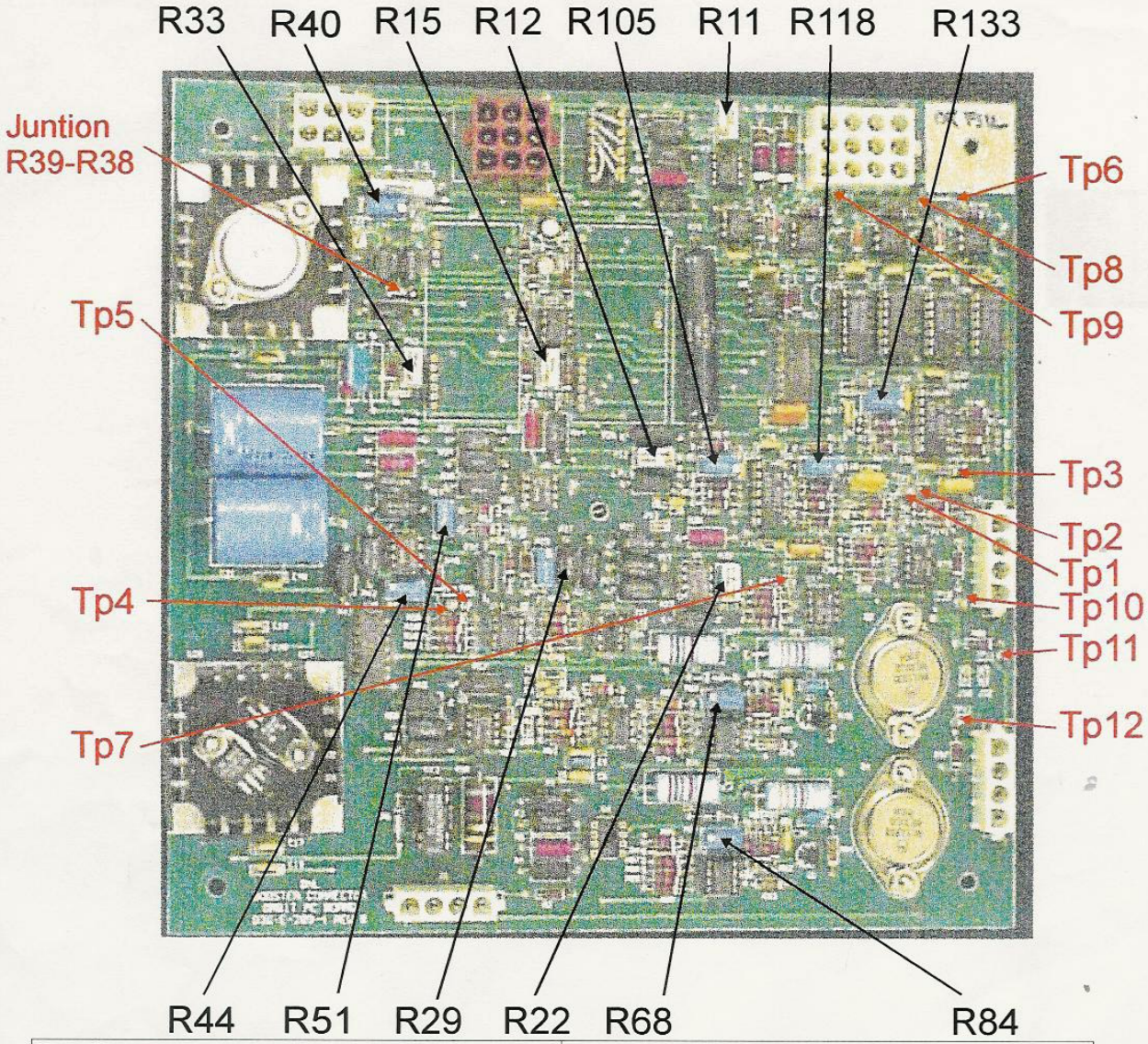
30) Hook a function generator up to Analog ref BNC able to swing from +10vdc to -10vdc.

31) Make sure power supply tracks reference without any oscillations.

32) Check the slew rate board if power supply is equipped and make sure it is set for 0 to +10v in 0 to 10msec. (except for the skew quad it's slew is 0 to +10v in 0 to 20msec.)

33) Adjust the DC over current by running power supply approx 1 to 2 amps over its rated output and adjust R105 until power supply trips off on DC over current.

Test Points and Pots Locations in Orbit PCBoard



Test Points			
Tp1	-Thermistor Bank #1	R11	-Calibration Analog Out
Tp2	-Thermistor Bank #2	R12	-Gain Cal Out
Tp3	-Temperature Limit Setup	R15	-Offset Pot Out
Tp4	-U7 Out (Analog In/2)	R22	-DCCT Gain
Tp5	-Over Current (U5 after Gain &	R29	-DCCT Zero Adjust
	Balance)	R33	-Offset Pot In
Tp6	-Transistor Over-Temperature	R40	-Analog In Gain
Tp7	-Error Out	R44	-Analog In Balance
Tp8	-Regulator Error	R51	-Analog In Zero Adjust
Tp9	-DC Over-Current	R68	-Pos. Idle Current Calibaration
Tp10	-Driver 1	R84	-Negative Idle Current Cal.
Tp11	-Commun	R105	-Over Current Limit
Tp12	-Driver 2	R118	-Regulator Error
		R133	-Temperature Limit Cal.

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